Engineering Mechanics

Code: CE202

Case-Study

---

1. **Introduction:** This course introduce the Principles required to solve engineering mechanic problems. It addresses the modeling and analysis of Static equilibrium with an emphasis on real world engineering applications and problem solving.

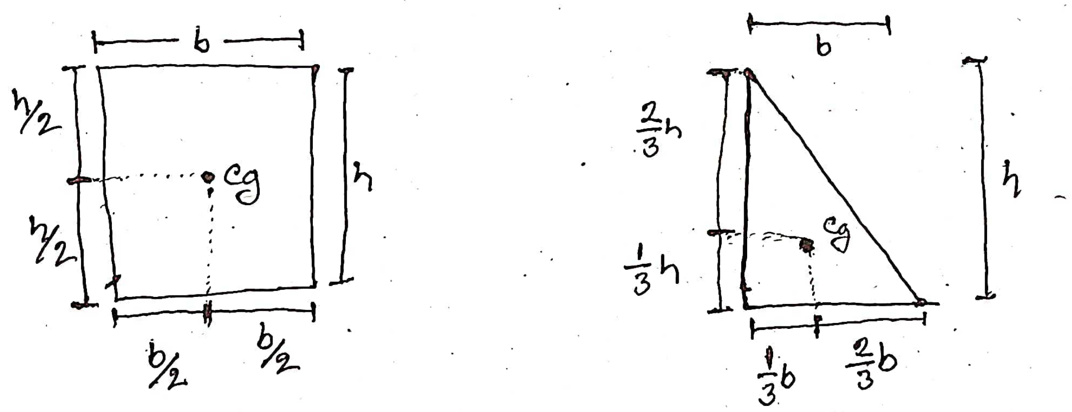
2. **Objectives:** The subject of 'Engineering mechanic is that branch of Applied Science, which deals with the laws and principles of mechanic, alongwith their applications to engineering problems. As a matter of fact, knowledge of Engineering Mechanics is very essential for an engineer in planning, designing and Construction of his various types of Structures and mechanic. In order to take up his job more skilfully, an engineer must persue the Study of Engineering Mechanic in a most systematic and Scientific manner.

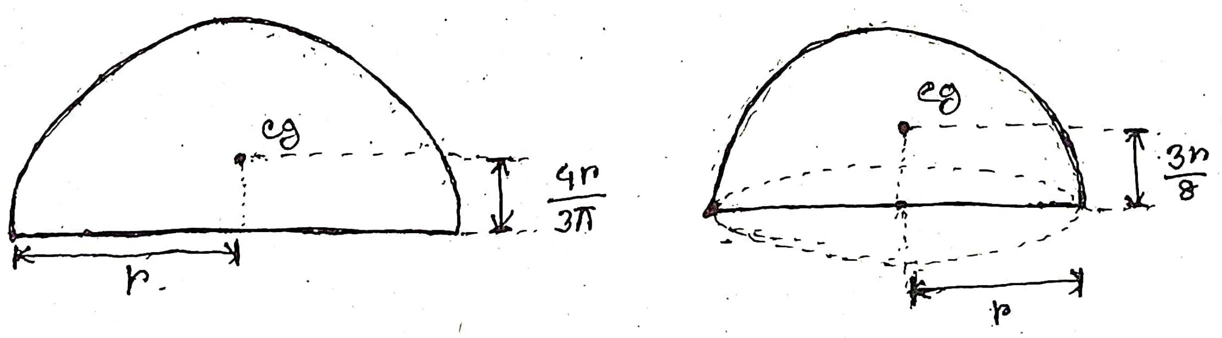
③ Briefly illustrate the Centre of Gravity.

Answer:

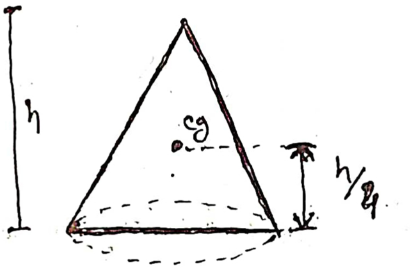
The centre of gravity is a geometric Property of any object.

centre of gravity is a single point about which the entire weight of a body acts.
It is denoted by "c.g.". Cg. is consider for only those bodies which have mass or volume.

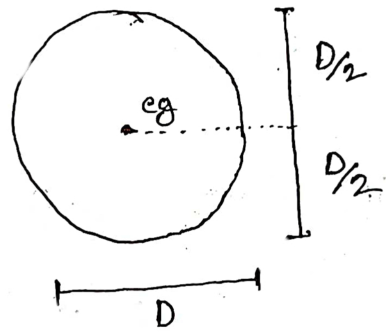




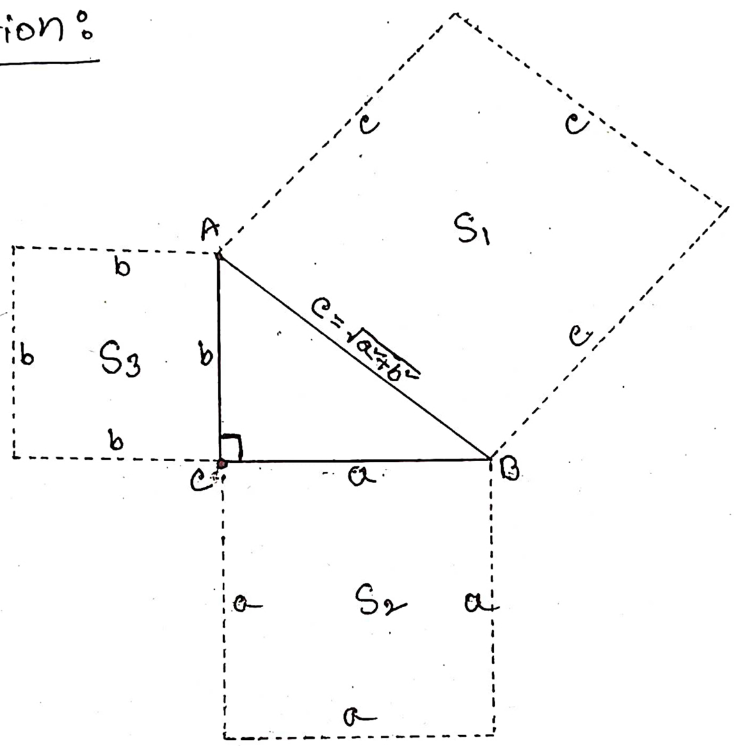
Hemisphere



Solid cone.



④ Solution:



Prove that the area of the square S_1 is equal to the sum of the areas of the squares S_2 or S_3.

$$S_1 = S_2 + S_3$$

Area of $S_1 = c^2$
$= \left(\sqrt{a^2+b^2}\right)^2$
$= a^2+b^2$

Area of $S_2 = a^2$ .... (i)

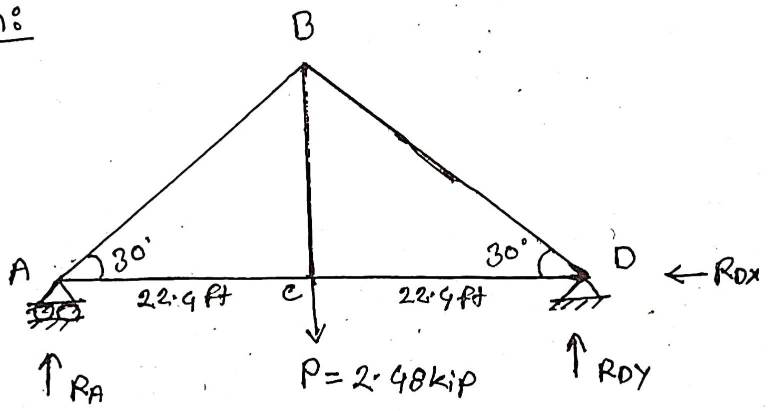
Area of $S_3 = b^2$ ..... (ii)

Now, (i) + (ii)

$S_2 + S_3$
$= a^2 + b^2$
$= c^2 \quad [\because c^2 = a^2+b^2]$
$= S_1$

$\therefore S_1 = S_2 + S_3$ (Proved)

5) Solution:



Roll: 7662

$P = 62/25 = 2.48$ kip

$AC = 10 + 62/5$
$= 22.4$ ft

$CD = 10 + 62/5$
$= 22.4$ ft

Find Reaction:

$\Sigma M_D = 0$ (↻+)

$\Rightarrow -2.48 \times 22.4 + R_A \times 44.8 = 0$

$\Rightarrow R_A = 1.24$ kip (↑)

$\Sigma F_y = 0$ (↑+)

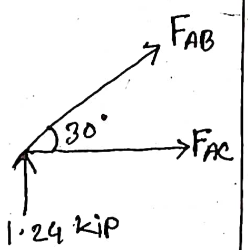
$\Rightarrow 1.24 - 2.48 + R_{Dy} = 0$

$\Rightarrow R_{Dy} = 1.24$ kip (↑)

$\Sigma F_x = 0$ (→+)

$\Rightarrow R_{Dx} = 0$

Now, Joint A:



$\Sigma F_y = 0$ (↑+)

$\Rightarrow 1.24 + F_{AB} \sin 30 = 0$

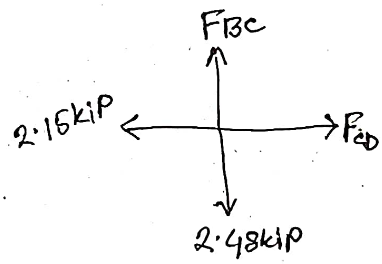
$\Rightarrow F_{AB} = -2.48$ kip (C)

$\Sigma F_x = 0$ (→+)

$\Rightarrow F_{AC} + (-2.48 \cos 30) = 0$

$\Rightarrow F_{AC} = 2.15$ kip (T)

Joint C:



$\Sigma F_y = 0$ (↑+)

$\Rightarrow F_{BC} - 2.48 = 0$

$\Rightarrow F_{BC} = 2.48$ kip (T)

For symmetric truss:

$AB = BD$

$AC = CD$

(6) Result & discussion :

Members	Force(kip)	Nature
AB	2.48	C
AC	2.15	T
BC	2.48	T
BD	2.48	C
CD	2.15	T

Here, C = Compression force

T = Tension force

This is a symmetric truss. when applied 2.48 kip Joint load at point C. The reaction force is generated at support RA = 1.24kip & RDY = 1.24 kip. The compression force is generated in member AB & BD and Tension force is generated in member AC, BC and CD.